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EDITED BY WATSON DAVIS

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EDWIN E. SLOSSON, Director
WATSON DAVIS, Managing Editor

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A GREEN-HEADED IDEA

By Dr. Edwin E. Slosson.

As I was passing a florist's shop-window not long ago I saw a little image of a man's head in porous brown pottery, and on the top of it instead of hair there was a fine growth of grass, rising straight and thick from the forehead like Senator La Follette's hair. It occurred to me at once that this was a bright idea. For what good is hair anyhow? You can't pasture sheep on it, and you have to pay a barber to run a lawn mower over it and then he does not allow you anything for the crop. Now if we could grow grass instead it would cover the head quite as completely, and look as well - after we got used to the color - and, what further appealed to me, when the sod got thin the surface could be reseeded.

As I walked on the idea sank deeper into my brain. Would it not be possible that the grass growing on one's head might send down through its roots a constant supply of proteins, fats, carbohydrates and vitamins in the proper assortment so as to do away with the necessity of food? For it has always seemed to me an humiliating necessity, unworthy the dignity of man, that he should have to be dependent upon the plants for the fixation of solar energy that supplied his motive power. Just for lack of a little chlorophyl must man remain forever a parasite on plants? If man only had a head as good as a cabbage, he could accomplish the process of photosynthesis for himself.

Or, if man could not acquire the necessary chlorophyl, could he not form a close combination with some sort of plant life that possessed this power, as by farming out on shares any waste land he might have on his head? On looking up the matter I found, as I often do, that my idea was not so original as I supposed. I had, in fact, been anticipated by a million years or so, for certain sea creatures and land fungi, which, like man, were devoid of chlorophyl, had incorporated green vegetation which fed them the solar energy that they could not secure for themselves. The lichens have carried on such a partnership between plant and fungi for untold ages. The botanists call it "symbiosis", probably to avoid the commercial taint of the word "partnership".

But even though I had been beaten to it by the lichen it did not appear that any body had got a patent on symbiosis as applied to man. So I set about figuring out the acreage necessary for a home-grown dietary. I drew the outline of my hat band on a sheet of paper and laid it off in centimeter squares with a ruler. The area added up to 260 square centimeters. I sent this figure to a friend of mine who knows more about the value of solar radiation than anybody else, and asked him how many hours I would have to sit out in the sun to receive

enough energy to equal what I now take in as food. My dietary I figured as roughly 3000 calories a day on the average, including a rather hearty Sunday dinner.

He wrote back that I would have to have more of a swelled head thatn I had already to carry out the scheme. Iddid not understand what he meant at first, but on going over his figures I saw the difficulty. One square centimeter of the earth's surface at the equator receives from the sun, or would receiveif there were no clouds or atmosphere, .00194 calories a minute. At the latitude of Washington and sea level, a square centimeter receives in the course of a year only about 152 calories. Accordingly the solar expert to whom I referred the question concludes:-

"For your requirements of approximately a million calories a year, the diameter of your head would have to be increased between five and six fold, in order to receive enough energy from the sun to sustain your mental and physical operations, and you would have to sit out in the sun all day long, every day in the year. These figures take account of the losses in the atmosphere and the obliquity of the rays, so you could hold your head up straight and not have to turn it around like a sunflower, as you suggest."

I do not easily give up an idea, so I measured my back and calculated its area, only to find that this, however well sodded, would not be a third large enough. Worse still I found that the green leaves are shockingly inefficient transformers of energy. They store up in the form of combustible or edible products only about one per cent. of the radiant energy they get from the sunshine. It would then take some three hundred mossbacks, working full time. to provide my necessary nutriment.

So I have been forced to admit that my scheme is impracticable, at least in its original form, but my figuring has the stronger confirmed by belief that some way might be found to make use of solar radiation for human purposes, without wasting more than ninety-nine per cent. of it, as is done by employing plants as intermediaries. An area of twenty square feet in latitude 38 degrees and at sea level, receives energy enough through the year, counting all the days as sunny, to give one horsepower continuously. If the weather is half cloudy forty square feet would amount to one horsepower. This means that taking the country through each acre of land is getting more than a thousand horsepower, and each square mile more than a half a million horsepower of free energy from the sun, and yet we make no use of it except such infinitesimal fraction as may be converted into food or fuel by vegetation, or may raise water to the clouds to come down as rain and perchance to be caught by a water-mill, or may stir up the atmosphere to be used in running a few scattered windmills. It does seem to me that we might use a little more of this wasted wealth than we do. But the problem is too big for my head to solve.

GREAT HASTE MAKES LESS WASTE

In training workers as chocolate dippers, R. St. C. Brooke has reported to the National Institute of Industrial Psychology in London that he has found a striking tendency for the proportion of spoiled work to decrease as production increases. Prof. Brooke holds that the decrease is due to greater attention given to the job by the workers when moving at high speed.

RUSSIAN EXPEDITION EXPLORES NOVA ZEMBLA

More than 200 Russian scientists, explorers, map makers and their assistants now are in the barren mountains of Nova Zembla attempting a complete survey of one of the world's least known lands. This expedition, perhaps the largest and most skilled ever sent into the Arctic, left Leningrad on July 18 under the direction of the Leningrad Academy of Sciences.

First discovered by the English explorer, Stephen Borough, in 1556, the great Arctic land off the coast of European Russia with its lifeless waste of interior has remained much of a mystery ever since. It is shaped like an elongated crescent and contains about 36,000 square miles. It is part of the Russian provice of Archangel, and is practically a continuation of the hilly country of North Russia, only about 37 miles of strait separating it from the mainland.

The northern section seems to be covered by a great ice sheet. The interior consists of a main mountian chain with traverse chains thrown off in different directions, separated by deep, narrow valleys some of which are watered by streams of considerable size. During the spring thaw these rivers bring down large masses of rock fragments. On the north and south extremeties the mountains descend to a comparatively low plateau with level valleys dotted by a multitude of lakes.

Gooseland, on the south, is covered in the summer with grasses. Elsewhere even leaved lichens are scarce, although leather lichens flourish. In places where a little humus has formed flowering plants appear, the brilliant flowers seeming to spring directly from the ground, concealing the smaller leaves. The complete flora thus far known numbers about 200 species. The interior is practically devoid of animal life - only stray white foxes, white bears and immigrant reindeer. The sea coast, however, is covered during the summer with countless birds. Millions os auks swarm on the rocks. Great flocks of ducks, geese and swans swarm every summer on the valleys and lakes of the south. There is good salmon fishing in the rivers.

The Russian government in 1877 made an attempt to settle the south coast. A few families have remained, and one village, Karmokully on Moller Bay, has a church.

Attempts at exploration have been numerous. Some expeditions have succeeded in crossing the southern section and others have penetrated the interior mountians, but the information obtained has been fragmentary.

FRIENDLY MICROBE RUNS AMUCK

Some time ago, when a French scientist, d'Herelle, announced the discovery of what he called "bacterophages", the medical and scientific communities all stood up and gave three cheers. Bacterophages - the name, being translated, means simply "bacterium-eaters" - are ultramicroscopic creatures, smaller even than bacteria, that are able to pass thru apparently solid things, and seem to have a most wonderful appetite for bacteria, making short work of them wherever they find them.

That, indeed, seems to be the trouble in the present instance. The

undiscriminating bacterophages have been found by a group of bacteriologists to be attacking and feeding on microbes that are useful to man. They are preying on the nodule bacteria of beans, clover and other members of the legume family, which as is well known benefit agriculture by capturing free nitrogen from the air and eventually feeding it to the plants, and thus increasing the fertility of the filds.

For some time a mysterious disease of unknown nature has been noticed in clover and other leguminous crops, depleting the nodules on the roots of their rightful bacterial population and decreasing the yield and soil fertility. Now the blame has been fastened on errant bacterophages. Whether these are of the ordinar usually beneficial variety, that have simply jumped the fence and run wild, or whether they are a new predatory sort-wolves instead of watchdogs - is as yet undetermined.

ORIGINAL CRUST OF EARTH SHOWS EARLY CLIMATE COLD

The earth's earliest rocks, formerly supposed to have been formed by the cooling of the original hot, malted crust of the globe, were made in a cool climate, Prof. A. P. Coleman of Toronto University recently told the British Association for the Advancement of Science.

Although these early rocks contain no fossils, their formation indicates cooler conditions than those under which the great fern forests which formed our coal measures flourished and cooler than the time when dinosaurs roamed the earth.

"The evidence is growing," said Prof. Coleman, "that climates and geological processes in that early time were not widely different from those of later times."

Prof. Coleman pointed out the kinds of climate under which various strata of these early rocks, known to geologists as pre-Cambrian, were made:

"Passing downwards from the base of the Cambrian in Canada," he said, "the Keweenawan includes red sandstone suggesting desert conditions; the Animikie, with gray carbonaceous slates, was probably a time of cool moist climate; the Huronian, including the Cobalt tillite was a time of glaciation.

"Below this, after a profound break, is the Sudbury or Timiskaming series, mostly of waterformed materials, including 4,000 feet of well banded graywacke and slate, evidently of seasonal origin. This gritty material and some boulder conglomerates make one suspect a cold and perhaps glacial climate.

"After another profound unconformity the Keewatin and Grenville series with carbonaceous slate and thick beds of limestone suggest conditions not very different from the present. The thousands of feet of boulder conglomerate in the Dore series are thought by some to be torrential deposits, but might equally well be accounted for as glacial."

Potato bugs cost American farmers $25,000,000.00 annually.

THIRSTY PLANTS TELL ABOUT DRINKING HABITS

How much plants drink, and when they drink, and why, are subjects of inquiry on the part of scientists working in the laboratory of plant physiology of the Johns Hopkins University. The name of the instrument used for measuring the potations of plants is appropriately enough, the "potometer". An improved form of this device, invented by Dr. B. E. Livingston and Mr. J. D. Wilson, promises to yield results of great interest to botanists and eventually of use to foresters, irrigationsists, and others interested in plant industry.

Heretofore all models of the potometer have been made for attachment to the cut ends of plant stems or branches. This has yielded data of some interest and value; but after all a cut branch is a wounded plant, and one cannot expect results to be quite normal. The device of Dr. Livingston and Mr. Wilson enables whole and uninjured plants, with full sets of roots, to be used, thus giving results more nearly approaching conditions in nature.

The Livingston-Wilson potometer is very simple in its construction - so simple, in fact, that anyone can make it for his own experiments, if he so desires. All that it requires is a wide-mouthed bottle or jar, with a rubber stopper to fit it, and a short piece of slender glass tubing. The rubber stopper is pierced with two holes.

Through one of the holes a cutting of a woody stem, like willow or oleander, is passed, so that the rubber fits tightly about the bark. The cutting is allowed to stand in the jar of water until it strikes root and sets up in business as an independent plant. Then the jar is filled up level with water and the stopper set closely in, so that all air bubbles are squeezed out. The piece of slender glass tubing is passed through the second hole in the stopper and filled with water. As water is taken up by the plant, the tube acts as a gauge, indicating how much goes in and how fast it goes.

With a lot of these potometer jars, the two scientists are investigating plants of several different species, determining the effects of sunlight and shade, varying temperatures, factory smoke, poisonous gases, and a number of other factors, upon the rate of water intake.

HARVARD PROFESSOR SEEKS EVOLUTION CAUSE IN CELL STRUCTURES

Certain pehnomena of cells, long familiar to scientists, but looked at from a new angle, may give a clue in the long-sought cause of species changes, according to Prof. E. C. Jeffrey of Harvard University. For a generation or more biologists have known of the existence of the tiny objects in the nuclei of plant and animal cells, called chromosomes. From certain peculiarities in their behavior, it is assumed that they are the principal carriers of hereditary characters and q qualities. Any new characters, therefore, or any new arrangement of old ones, that would arise in the origination of a new species, would be expected to be reflected in the chromosomes of its cells.

Any given species of plant or animal always has the same number of chromosomes in each of the millions of cells that make up its body. This also is a fact well-known to biologists; but Professor Jeffrey points out that in many species that are different from each other, yet obviously related in a kind of

cousinship, there is a mathematical relation between their respective chromosome numbers. For instance, in certain related plant species the chromosome numbers have been found to be 18, 27, 36 and 45, all multiples of 9. In one hybrid into which several of these species had been combined the number was 90 - again a multiple of 9. Other species may show multiples of other numbers, like 14, 21 and 28, which are multiples of 7; or 22, 44 and 55 - multiples of 11.

It is known that when plants are crossed or hybridized, the number of chromosomes in their cells frequently takes on this multiple nature. Professor Jeffrey suggests that natural hybridization may be an explanation of the origin of species. This is in interesting agreement with the opinions of an eminent Dutch scientist, J. P. Lotsy, who has come to much the same conclusion through work of entirely different nature.

NEW METHOD FOR MAKING NITRATES DISCOVERED

A new process for the fixation of atmospheric nitrogen in a form so it can be used for fertilizers or explosives was explained before the chemical section of the British Association for the Advancement of Science by W. A. Bone, professor of chemical technology, at the Imperial College of Science, London.

Nitrogen is naturally a very inert gas, and it is difficult to get it into an active state so it will combine with other elements, such as oxygen or hydrogen. In the commercial processes an electric spark or a metallic catalyst is used to get the nitrogen to enter into combination.

But Professor Bone finds that nitrogen can be activated by proximity to carbon monoxide in combustion under pressure. Carbon monoxide can easily be procured in quantity from blast furnaces or by passing air through a bed of red hot coal. When this gas is put together with air into a bomb under a pressure of a hundred atmospheres and the mixture exploded, the carbon monoxide unites with the oxygen of the air to form carbon dioxide. But when this combination takes place under such circumstances the heat produced by the combustion is of such a quality as to be absorbed by the nitrogen molecule and set it into such an active state that it will in turn unite with other oxygen molecules of the air. This combustion produces oxides of nitrogen from which nitric acid or nitrates of any sort can be readily derived. The nitrogen excited by the explosion of a mixture of carbon monoxide and air combines with oxygen more readily than does nitrogen which has been raised to a correspondingly high temperature by exploding a mixture of hydrogen and air.

AMERICAN ASTRONOMERS MEET IN NEW ENGLAND

The American Astronomical Society in session at Hanover, N.H., recently elected as honorary member A. S. Eddington, professor of astronomy at Cambridge, England. Prof. Eddington addressed the society on the subject of stellar evolution. He expressed the idea that the evolution of matter occurs practically all before a star appears as such, and that the evolution of the stars as we witness it in the universe is due to annihilation of matter. This annihilation of mass is brought about by a collision of electrons, the most minute bodies known. When such collisions are sufficiently violent the matter of the electrons disappears

and is transformed into energy, which is radiated into space with the velocity of light. In other words, the electrons literally blow up. In experiments conducted in Switzerland such radiations have been observed even through a thickness of ice measuring several feet.

A long discussion about the nature of the distances and the masses of the mysterious spiral nebulae led to the conclusion that calculations based on the hitherto observed rotations indicated masses of a billion times that of the sun, which seems difficult to believe, as it would alter very materially conditions in our part of the universe.

Prof. Asaph Hall of the Naval Observatory communicated new observations of Saturn from which he concluded that the mass of this planet is 3494 times smaller than that of the sun. Observations of the planet Venus made at the Mt. Wilson observatory led to the conclusion that its temperature is about zero Fahrenheit.

WHAT'S BALL LIGHTNING? SCIENTIST WONDERS

What is "ball lightning"?

The expression is ancient. Doubtless some of the millions who have used it have seen lightning that appeared to fit such a description.

But its actual occurence is very rare indeed. "The strangest of meteors", is how Dr. W. J. Humphreys of the U. S. Weather Bureau describes it.

Very little is known about it. Dr. Humphreys requests that whoever observes this rare phenomenon send him a complete description with the following details:- date, witnesses, geographic location, time during the strom, duration, color, size, shape, sharp or blurry outline, whether with or independent of wind, direction of motion (vertical, inclined or horizontal), kind of motion (smooth or jumpy), effects produced, indoors or outdoors, and if the former, how it got in.

All the previous writing on the subject contains very little real information, Dr. Humphreys says.

CHINESE PROGRESSING IN MODERN BOTANY, SAYS CHICAGO PROFESSOR

Prof. John M. Coulter, head of the department of botany of the University of Chicago, lectured during the session of the British Association for the Advancement of Science on the progress of botanical study and research in China, as he saw it during his recent five-months' visit. The most important botanical work, said Dr. Coulter, is being conducted at the National South-Eastern University of Nanking and at Nanking University. It is notable in being concerned chiefly with practical problems in developing the natural resources of the country. The untouched possibilities of China are most impressive. The College of Agriculture of South-Eastern University at present has one large experiment station and nine substations, all well equipped.

The principal botanical enterprizes under way in China are, first, a complete collection of the native plants of Central China, not only for purposes of classification but also as sources of valuable raw materials and drugs; second, reforestation, for most of China is completely denuded of trees; third, improvement of vegetables, notably the soy bean; fourth, improvement of cotton, fifth, studies on bamboo; sixth, problems of plant disease.

DENIES VALUE OF GLAND OPERATION

The Steinach operation which has been performed in this country and especially in Europe to restore sexual vigor in old men has been studied in the zoology laboratory of the University of Chicago, and according to Assistant Professor Carl R. Moore, under whose direction the research has been carried on, it appears to be wholly useless.

Animals operated on in the manner described by Steinach do not give the results which he describes, Dr. Moore states. The Steinach operation involved the tying off and blocking of the outlet duct from the male gland. Scientifically the process is known as ligation of the vas degerens.

This caused part of the gland to degenerate, according to Steinach. The Steinach theory holds that as one part of the gland degenerates, a second part of the gland is caused to increase in size. The latter part, called the interstitial gland, is considered by him to be responsible for rejuvenation and the return of youthful vigor. The experiments at the University of Chicago practically proved that the original assumption is false; that there is neither degeneration of the gland when the outlet duct is tied, nor an increase in the interstitial gland.

Working on the experiment Dr. Oslund found that a vas deferens ligation of ten months duration in a rat and guinea pig was followed by perfectly normal glands; no degeneration having occured in that length of time. Some degenerate glands did appear in Dr. Oslund's material, but they were not sufficiently related to the time interval after operation to be due to blocking the outlet duct or vas deferens.

Prof. Moore and Wm.J. Quick have recently completed a number of operations on the rabbit and it is now believed that Steinach was misled in his interpretations on account of degeneration being caused by an abnormal displacement of the gland. Moore has found that an animal can sterilize itself with its own body heat if the glands are slightly misplaced. The Steinach operation on rabbits was studied from thirteen days after completed closing of the vas deferens (a time, according to Steinach, where degeneration takes place followed by regeneration) to longer than six months after the operation. It was found that ligation did not cause the glands to degenerate within six months after the operation. The interstitial part, contrary to Steinach, has not been found to increase in amount.

In the United States, 1,200,000 cows live within the limits of incorporated cities.

GERM MAY CAUSE THREE DISEASES

Infantile paralysis, encephalitis or "sleeping sickness" and epidemic hiccup, may be due to the same bacterium in different stages of its life cycle. Such is a suggestion made by Dr. E. C. Rosenow of Rochester, Minn., as the result of a study of a germ known as the "green-producing streptococcus".

This villain inhabits the human throat during seasons when any of the above diseases is prevalent, although not every person who gives it lodging falls a victim to any one of them It is commonly found in the throats of infantile paralysis "carriers" during epidemics although the throats of the same persons are free of it at other times. Dr. Rosenow states he found that after passing through experimental animals, strains of this bacterium which apparently caused hiccup acquired the power to produce epidemic encephalitis.

He suggests that during epidemics these germs acquire more deadly properties and that this virulence is the immediate cause of the epidemics.

HIGH MEAT RATION MAKES KIDNEYS GROW

New light was thrown on the much-discussed and wide-spread belief that "too much meat is bad for the kidneys" by a paper presented before the physiological section of the British Association for the Advancement of Science, by Prof. Lafayette B. Mendel of Yale University. Dr. Mendel and his associates experimented with rats, to which they fed huge quantities of meat, together with enough of other foods to maintain good health. They found upon dissection that the animals' kidneys were strikingly overgrown, but could not find any inflammation or other indications of bad health. Evidently the kidneys, finding the demands upon them greatly increased, simply grew up to meet the new job; and that was all that happened.

LACK OF EYE BALANCE MAY CUASE CLUMSINESS

The man who is clumsy with his hands, who cannot perform delicate tasks with tools, shoot straight, or play such a game as baseball probably lacks a correct balance between the muscular systems of his two eyes, E. C. Clements, British physician and aviator, told the psychologists of the British Association for the Advancement of Science.

This observation resulted from studies of eye disorders which rendered British pilots incapable of landing airplanes successfully during the war.

Two factors are involved in successful binocular vision, he said:

The impulses which are received from the two eyes must be interpreted correctly by the brain.

In response to this stimulus there must be efficient co-ordination of the muscles responding.

In many cases such defects can be removed by special visual training exercises, he said.

TABLOID BOOK REVIEW

MARINE PILING INVESTIGATIONS. By William G. Atwood and A. A. Johnson. Washington, National Research Council, 1924.

This book is the first and only comprehensive publication on marine timber-borers, the damage they do, and methods of combating them which has appeared in the United States. The biology of the species is excellently summed up, the merits of various "borer-proof" timbers are considered, and full descriptions of present methods of pile-armoring and protective chemical treatment given. An especially valuable section is the report by the Chemical Warfare Service of their collaborative research for new methods. Detailed reports of the work done in all the principal harbors of the United States, island possessions, and some foreign countries, together with a full bibliography, complete the volume. The book is indispensable to harbor engineers, steamship companies and seaboard lumber operators.

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EVOLUTION. By Vernon Kellogg. New York, Appleton, $1.75.

This is a book that has long been needed and never more needed than now, a plain and competent explanation of what modern scientists understand by evolution; a book not too long and not too technical; readable as well as reliable; level-headed and good tempered. That the author was for more than twenty years professor of entomology at Stanford and is now Permanent Secretary of the National Research Council attests his scientific standing while his ability to write in a way to interest young and old is proved by the popularity of his "Insect Stories" and "Human Life as a Biologist Sees It". This is a volume for the open shelves of the public or school library.

POISONOUS GAS TO MAKE PLANTS GRO

The injurious effects of illuminating gas on plants was the subject of discussion by Dr. William Crocker, of the Boyce Thompson Institution for Plant Research, Hoboken, N. Y., before the meeting of the British Association for the Advancement of Science. The general effects of gas upon plants have long been noted; in the present instance the various ingredients were studied separately and in controlled concentrations. Various gases of the oil-gas or coal-gas series, together with carbon monoxide, an ingredient of water-gas, were used.

Of these, ethylene, acetylene, propylene and carbon monoxide are very similar in their effects, but ethylene is outstanding because of the minute concentration in which it modifies the nature of the growth or produces injury. One part of this gas in ten million of air modifies the growth of the plants most sensitive to it. It proves to be the constituent of illuminating gas that determines the minimum injurious concentration.

In general, this limit is not due to the killing action of ethylene, but to its remarkable power in inducing growth in dormant organs or in modifying the nature of growth already occuring. In fact, the killing action of ethylene is very low. In some of the experiments, high concentrations were used without killing the plants; but much greater modifications in growth did occur in these.